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~~polypyrrroles, polyselenophenes, polyacetylenes formed from soluble precursors and combinations and blends thereof.~~

REMARKS

Applicants hereby confirm their election of the claims of Group I, to wit: claims 1-14, 23, 31-36 and 43-47. Accordingly, applicants have cancelled without prejudice the claims of Group II (claims 15-22 and 37-42) and the claims of Group III (claims 24-30 and 48-52).

Applicants have corrected certain minor errors of form in the specification which do not bear on the substantive content of the application.

The Examiner is respectfully requested to reconsider his rejection of claims 1-7, 23, 31, 32 and 34 under 35 U.S.C. §112, second paragraph as being indefinite as to the meaning of the term "polydopant." The term "polydopant" is defined on page 2, lines 19-22 of the specification as a dielectric polymer which provides the proton to protonate the other polymer in the blend to the conducting state. (Emphasis added) With this definition in mind, there should be no confusion that the term applies to a polymer. The claims as amended should also cure this rejection.

Page 11, line 14 thru page 12, line 4 of the specification provides an explanation of the expression "frustrated blend" of polymers. The explanation clearly defines the meaning to be a description of two polymers frozen into a homogeneous non-equilibrium state that are unable to phase separate as a result of kinetic limitations that have been imposed on the polymers as a

result of physical restrictions.

The claims under examination in this case have been cancelled and new claims substituted therefor which more clearly and accurately define the scope of the present invention. The two polymers that form the bases for the blend have been defined as "a Lewis base electrically conductive polymer in undoped form and a Lewis acid polymer dopant." These two aforementioned polymers are soluble in a common solvent and react homogeneously in a solution. Because in solution there is a Lewis acid/Lewis base interaction the two polymers form a compatible blend so that no phase separation occurs. The broadest claim, 53, provides that the reaction is performed in an organic solvent and that the resulting reaction product blend is miscible at the molecular level. The prior art cited by the Examiner as detailed below at best, mentions polymers similar to those disclosed in the present invention. However, the fact that these references deal with polymers comprising aqueous-based acids as opposed to polymers soluble in organic solvent provides basically a difference in kind rather than degree between the instant invention and the references cited.

As compared with the prior art, in this case the doping can be reversed, as, for example, in the case of polyamic acid which can be thermally cured to polyimide resulting in a compatible conductive blend polyaniline/polyimide blend. In the "frustrated blend" as defined in claim 66, the structure of the polymer blend is diametrically opposed to the blends described in the prior art because the frustrated blend freezes or locks the polymers that

would otherwise phase separate into a homogeneous non-equilibrium state or condition as a result of kinetic limitations or physical restrictions. This phenomenon is not directly disclosed nor implied in any of the prior art references cited.

The Examiner is respectfully requested to reconsider the rejection of claims 1-14, 23, 31-36, 43-47 under 35 U.S.C. §103 as being unpatentable over each of U.S. Patents 4,933,106 to Sakai et al., 4,940,517 to Wei, 5,068,060 to Jen et al. or 4,771,111 to Tieke et al.

U.S. Patent 4,933,106 to Sakai et al. does not teach the use of a polymeric acid as a polydopant. The doping in this patent is accomplished electrochemically, that is, the conductive polymer in the undoped state acts as an electrode in an electrolytic cell wherein the polyacid is simply the electrolyte. The conductive polymer is doped by the application of a voltage which causes oxidation of the polymer backbone resulting in radical cations. The polyacid is simply incorporated as the counteranion of the conducting polymer. It does not function as a dopant. The acid does not oxidize the conductive polymers, the applied voltage does. The resulting conducting polymer/polydopant blend is not soluble. It is a film or a powder, it does not form a gel.

U.S. Patent 4,940,317 to Wei et al. discloses the polymerization of aniline in the presence of an initiator. In one embodiment it does disclose the use of polysulfonic and polyacrylic acids as electrolyte chemical or electrochemical for polymerization of aniline and derivatives. In the electrochemical case it is

similar to Sakai et al. In the chemical polymerization, the polyacid does dope the polyaniline. However, the polyaniline/polyacid precipitate from solution. It is not soluble, that is, the polyacid/polyanilines is an insoluble powder. It cannot form a solution and cannot form a gel. Aniline is polymerized within the polyacid.

A gel is not an obvious modification based upon Sakai et al. and Wei et al. since in the present invention it stems from the interaction of the Lewis acid polymer and the Lewis base polymer. A gel is not possible based upon the teachings of Wei et al. as the polymer blend in Wei et al. is a powder. Likewise, it is not possible in Sakai et al. since the doping is done electrochemically and the result is a film. In neither Sakai et al. nor Wei et al. does one have a solution of a conducting blend of polymers.

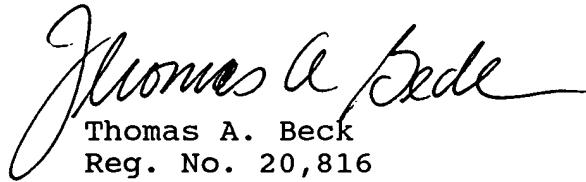
U.S. Patent 5,060,060 to Jen et al. disclosed filling polyamic acid or polyimide with a conductor such as graphite. This is a filled type of conductor. Fillers do not interact with the host polymer. The disclosure does not relate to the present invention. In the present invention, there is an acid/base interaction between two polymers in solution, for example, polyamic acid and polyaniline resulting in a conducting complex which is in solution and subsequently gels as a result of the interaction of the two polymers.

U.S. Patent 4,771,111 to Tieke discloses taking a polyimide film on an electrode and polymerizing a pyrrole within the polyimide to render a polyimide/polypyrrole composite. The

polyimide acts simply as a host or a matrix similar to common composites. It does not react with the pyrrole. The polyimide precursor, polyamic acid is not used as the dopant as is the case in the present invention. Applicants disclose the interaction of polyamic acid and polyaniline in an acid/base reaction to yielding a product that is soluble and miscible at the molecular level blend. Upon curing the miscibility is retained and the polyaniline/polyimide chains remain sandwiched. Tieke, is a filled type system in which polypyrrole is incorporated into polyimide. There is no interaction and no miscibility of the products.

As a result of the amendments of claims and the arguments presented herein. Applicants respectfully request allowance of claims 53-76.

Respectfully submitted,



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Thomas A. Beck Oct 27, 1992
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